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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/787,530	02/26/2004	Kumin Yang	RPI-3877	6476

5409 7590 02/14/2007

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EXAMINER	
POULOS, SANDRA K	
ART UNIT	**PAPER NUMBER**
1714	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/14/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/787,530	YANG ET AL.	
	Examiner	Art Unit	
	Sandra K. Poulos	1714	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 November 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-28* is/are pending in the application.

4a) Of the above claim(s) *17-28* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4-6 and 9-16* is/are rejected.

7)☐ Claim(s) *3,7 and 8* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *2/26/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of Group 1, claims 1-16 in the reply filed on 11/30/06 is acknowledged. The traversal is on the ground(s) that "all of the subject matter of all claims 1-28 is sufficiently related that a thorough search for the subject matter of any one group of claims would encompass a search for the subject matter of the remaining claims" and therefore "the search and examination of the entire application could be made without serious burden." This is not found persuasive because the subject matter of Group 1 and 2 would not necessary encompass each other given that Group 1 is drawn to a method of forming a nanocomposite wherein the SCF has an active role in exfoliating and dispersing the clay throughout the polymer-clay melt, whereas Group 2 is drawn to a nanocomposite composition where the SCF is merely contacted with the composition and there is no recitation of exfoliation or dispersion of the clay. Thus, the method of Group 1 does not necessary produce the composition claimed in Group 2. Furthermore, given that the inventions of Group 1 and 2 have acquired a separate status in the art in view of their different classification, restriction for examination purposes as indicated is proper (see restriction requirement 11/07/06).

The requirement is still deemed proper and is therefore made FINAL.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 15 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 15 further defines the layered clay of claim 1 as an aliphatic fluorocarbon, perfluoroalkylpolyether, quarternary ammonium terminated poly(dimethylsiloxane), an alkyl quarternary ammonuim complex, glass fibers, carbon fibers, carbon nanotubes, talc, mica, natural smectite clay, synthetic smectite clay, montmorillonite, saponite, hectorite, vermiculite, beidellite, or stevensite. This is unclear because aliphatic fluorocarbon, perfluoroalkylpolyether, quarternary ammonium terminated poly(dimethylsiloxane), alkyl quarternary ammonuim complex, glass fibers, carbon fibers, and carbon nanotubes are not clays.

Claim Rejections - 35 USC § 102/103

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1, 2, 4, 10 and 14-16 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Mielewski (US 2002/0082331). (NOTE: The reference qualifies as a 102(b) reference because

applicant does not have full support for the claimed method in the provisional application and thus has an effective filing date of 2/26/04).

Mielewski discloses a method of mixing layered silicate with a polymer to form a treatable silicate-polymer mixture and contacting the treatable mixture with the supercritical fluid to exfoliate the silicate particles so that the particles disperse within the polymer (abstract). The layered silicate is preferably montmorillonite, the polymer is polypropylene, and the supercritical fluid is carbon dioxide (para 17-18). The method includes mixing the layered silicate with the polymer to form a mixture (para 20), heating to form a flowable melt (para 20), contacting the polymer-clay mixture with a pressurized supercritical fluid exceeding the critical temperature of the SCF (para 21-22), and depressurizing the contacted mixture to exfoliate the silicate particles such that the particles are substantially dispersed (para 23). Mielewski discloses that the step of depressurizing includes immediately depressurizing the extrudate down to ambient conditions, which may be accomplished when the extrudate exits the extruder, at which time the pressure drops to ambient (para 23), and such a pressure drop would be a continuous (monotonic) decrease to ambient pressure. The example discloses that the extruder operates at a temperature of about 200 degrees Celsius (para 28).

Although Mielewski is silent with respect to the solubility parameters of the components, particularly montmorillonite, the methods and compositions therein are substantially similar to the currently claimed composition (which includes the recited carbon dioxide SCF, PP polymer, and montmorillonite clay), thus it is examiner's position that although it is not specifically recited, the composition in Mielewski would

nonetheless inherently meet the requirements for the currently claimed solubility parameters, or alternatively, would obviously have been present in the Mielewski product, absent evidence to the contrary.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 5-6, 9, 11 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mielewski (US 2002/0082331) in view of Lee (US 2003/0205832).

The discussion with respect to Mielewski in paragraph 3 above is incorporated herein by reference.

Although Mielewski discloses an extruder, he does not disclose use of a twin screw extruder.

Lee discloses a methods of producing nanocomposites with nanoclays such as montmorillonite mixed with polymers (abstract; para 7). Supercritical CO_2 is dissolved in the polymer (para 5). Preparation of the nanocomposite includes using a co-rotating

twin screw extruder at a screw speed of 200 rpm (para 64-69). It would have been obvious to one of ordinary skill to use a co-rotating twin screw extruder as the extruder in Mielewski because Lee discloses that it is effective in producing nanocomposites contacted with supercritical CO_2 and that the clay has good dispersion and is exfoliated (para 64-75).

Also, although Mielewski does not disclose that the pressure varies essentially discontinuously, he discloses that the extrudate is depressurizing to ambient pressures, and since atmospheric pressure can vary, it would have been obvious to one of ordinary skill in the art that changes in air pressure would result in small fluctuations when the pressure is near ambient.

5. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mielewski (US 2002/0082331) in view of Lee (US 2003/0205832) as applied to claims 1, 2, 4, 6, 9-11, 13-16 above, and further in view of Homma (US 2004/0249009).

The discussion with respect to Mielewski and Lee in paragraphs 3-4 above is incorporated herein by reference.

The references do not disclose the throughput of the extruder.

Homma discloses a method of processing a polymeric composition containing particles having a diameter below 5 micron, wherein it is preferably heat treated in a twin-screw extruder (abstract; para 114-116). Supercritical carbon dioxide or nitrogen is mixed with the polymer (para 137, 159-160). Homma discloses that the twin-screw extruder has a throughput of 40 kg/hr (para 232-233).

It would have been obvious to one of ordinary skill in the art to use the throughput as disclosed by Homma because it is typical of twin-screw extruders processing the same types of material as the references above.

Allowable Subject Matter

6. Claims 3 and 7-8 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

KR 2001103323 discloses a method of producing a nanocomposite by supercritical fluid.

US 2005/0256242 discloses producing a nanocomposite by including a nanofiller material and a SCF into a molten polymeric material within an extruder.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sandra K. Poulos whose telephone number is (571) 272-6428. The examiner can normally be reached on M-F 8:00-4:30 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vasu Jagannathan can be reached on (571) 272-1119. The fax phone

number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

SKP
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